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# Science News-Letter

*The Weekly Summary of Current Science*

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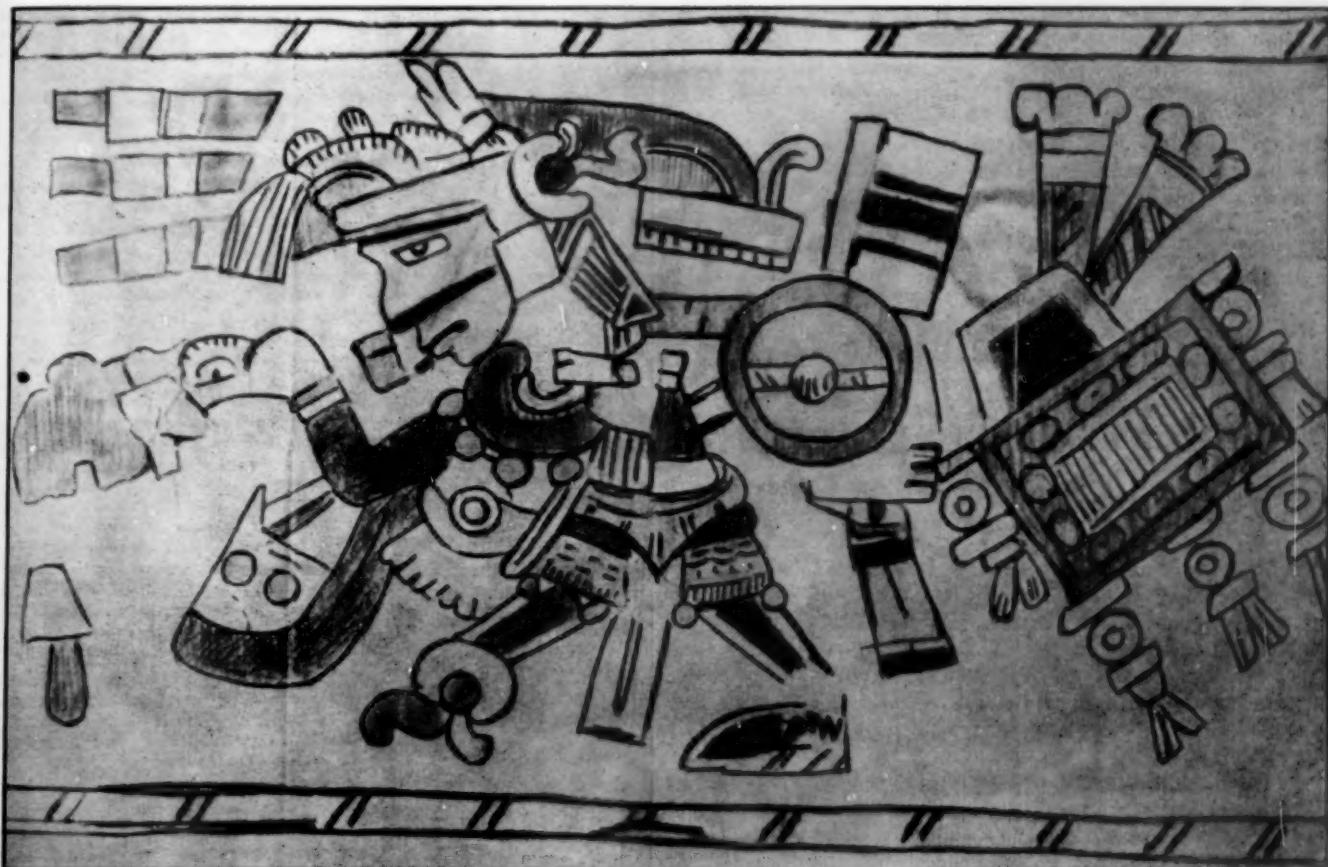
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ARCHAEOLOGY

## Aztec Temple, Sealed Four Centuries Ago, Reopened



TEZCATLIPOCA, great god of the Aztecs. This image of him was copied from one of the frescoes at Tizatlan by the official artist of the department of archaeology of the Mexican Ministry of Education

By EMMA REH STEVENSON

The ruins of a prehistoric Aztec temple recently discovered beneath fragmentary walls of one of the first Christian churches in the new world, near Tizatlan in the Mexican state of Tlaxcala, are gradually yielding their ancient secrets.

Tales of human sacrifice and weird midnight rites of penitence and mortification are told by beautiful fresco paintings on the sides of sacrificial altars found in the temple. Eduardo Noguera, of the Department of Archaeology of the Mexican ministry of education, who is in charge of

excavations at the site, calls these multicolored symbolic pictures true Aztec codices.

This makes the discovery rare in the realms of archaeology, for there are only thirty odd Mexican codices in existence. These historical, chronological or religious records in picture form of ancient American races are scattered throughout the museums of the world, in Florence, Vienna, London, Rome, Paris, Mexico City and elsewhere. They are on prehistoric paper of maguey or on parchment, or in case of codices made by the Indians after the Conquest, on

European paper or linen, but it is very unusual to find them painted on the walls of buildings.

The discovery of the Tlaxcalan temple once more flashes the strange life lived centuries ago in America on the screen of today.

The Tlaxcalans were an insurgent branch of the Aztec family. When almost all the rest of Mexico bowed to the yoke of the Montezumas, they built a wall around their sturdy mountain republic and continued their peaceful pursuits well protected

(Just turn the page)

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**Sealed Aztec Temple Reopened**

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by their reputation as the fiercest warriors in Mexico.

Their republic was divided into four parts, each governed by its hereditary lord. One of these was Tizatlan, and the ruins just excavated are believed to be the temple of its last lord, Xicotencatl.

The Tlaxcalans balked at becoming allies to Cortez, even against their hereditary enemies the Aztecs under Montezuma at Mexico City, until they had been defeated in several fierce encounters by the European soldiers mounted on curious animals and carrying deadly fire-spitting arms.

Young Xicotencatl, son of the old lord of Tizatlan, was never "sold" on the Conquistadores who had come marching up from Vera Cruz. He hid the treasure of his house from the greedy eyes of the white men, and when they least expected it he turned traitor toward them but was found out and executed. The whereabouts of his treasure, however, was never disclosed and has come down only as a legend to his present-day descendants in the mud hut and cactus village of Tizatlan.

The discovery of the temple ruins is but the last chapter in a 400 year old tale of buried treasure. A queer young Indian of Tizatlan named Panfilo Sanchez, and a direct descendant of Xicotencatl, claimed that his ancestor appeared to him in a dream a number of times and led him to the spot where the treasure was supposed to be buried.

All Tizatlan began to dig at the place marked out in the dream, with the result that the ruins of the ancestral temple of the ancient republic were discovered. No gold or gems were found, but the sacrificial altars with their gorgeous frescoes, more beautifully preserved than the ruins of the Christian church which covered the site four centuries ago, are real treasures in the eyes of scientists.

Two weeks after the natives of the village began their hasty digging, the Mexican Department of Archaeology took charge of the work and continued the excavations in a scientific manner.

The ruins are on the highest part of an artificial hill. The temple was probably erected in honor of Camaxtli, Aztec hunting god and the principal deity of the Tlaxcalans, Señor Noguera believes. It shows signs of violent destruction and was probably smashed by the invaders and replaced with a Christian church by the Spaniards, who used the spots sacred under the old religion as shrines for the new. A second Christian church, younger than the first, but already long in disuse, stands at the side.

Its back rooms, facing a sunny patio, have been used as a rural school for the last three years, incidentally the first school in the village of Tizatlan in four hundred years. One of the class rooms, filled with brown children busy at their varied tasks, serves also as a museum for the objects dug up in the ruins by the Indians and the government archaeologists.

The ruins are in the shape of a quadrangle in the center of which there are two stone platforms about a foot and a half high, four feet wide and six feet long. They are painted on three sides with colorful motives symbolic of sacrifice and death. The short front walls are divided down the middle by a vertical canal, probably for the collection of that sacred liquid offered to the Creator, the most precious thing a human had to offer, his own blood.

The fourth and unpainted sides of the two altars are flanked by a series of pillars badly broken by the treasure hunters. They are of plastered adobe with cores of wood within. A stairway made of true brick, the finest encountered in prehistoric American ruins, leads down to unknown

(Turn to page 53)



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## PHOTOGRAPHY

**3200 Pictures a Second**

Feeding movie film through a camera at the rate of three miles a minute to slow down rapidly moving machinery to about one two-hundredth of its normal speed is the feat accomplished by C. Francis Jenkins, of Washington. At the recent Detroit meeting of the Society of Automotive Engineers Mr. Jenkins told of the "chronoteine camera," one of his latest inventions, and how it may be applied to the study of automobile engines.

Instead of the sixteen pictures a second, taken by the ordinary movie camera, or the 128 taken by the "ultra-rapid" camera now frequently used in filming athletic events, the chronoteine takes 3200 pictures a second at its normal rate. If desired, it can be speeded up even further, and take as many as 10,000 a second. When these are projected in the ordinary machine at the speed of 16 a second, the apparent speed of the motion is correspondingly reduced. When taken at 3200 per second, the reduction of speed is 200 times, and at the higher speeds it is of course greater.

In the usual type of motion picture camera, the film is stopped for each exposure, so that it stops and starts sixteen times a second. At such high speeds as those employed in the chronoteine camera this is impossible, for the film would be torn to pieces. Therefore it is moved through in a steady stream.

A further difficulty is introduced, because with a single lens extremely short exposures would have to be made. Otherwise the picture would be blurred, just as if the object itself were close to the camera and moving at such a high speed. Mr. Jenkins has avoided this difficulty by providing 48 lenses, set in the periphery of a 13-inch disc, which turns at a speed of 4000 revolutions per minute. The film moves back of one side of this disc, so that the images formed by the lenses move right along with the film. In fact, the exposures overlap, as the exposure is begun through one lens before that through the preceding lens is completed. At 3200 exposures a second, each one is about one twenty-five-hundredth of a second in length. With the rapid lenses used, and sensitive film, this is easily sufficient for a fully timed negative in bright sunlight. In the ordinary movie camera, at 16 a second, each exposure is about one thirty-second of a second in duration.

(Just turn the page)

## PHYTOPATHOLOGY

**Pater Pathologorum**

LEWIS RALPH JONES

When some future chronicler of the science and practice of plant pathology draws up the genealogical chart of twentieth century phytopathologists, he will find the ancestral lines converging upon Jones of Wisconsin as the patriarch of the tribe. Even now, with the first quarter of the century scarcely closed, he is already an academic grandsire. For while his own classrooms and laboratories at Madison are still active in filling the ranks of his profession with young recruits, many of his earlier students have in their turn gathered groups about them who will in their turn go forth to preach the new gospel for the salvation of plants from parasitic damnation.

The days of Professor Jones' ministration have seen radical new revelations in plant pathology. The earlier science of plant diseases did not go much beyond compilations of lists of causal fungi, and the earlier practice of combating them consisted largely of drenching plants indiscriminately with "shotgun" sprays. Sprays are still the mainstay of the defense against such plant diseases as come to the surface, but attack on the hidden ills that plague the roots and interior organs, and even the hope of future combat against the surface enemies, are being sought in other ways. These ways are all based on the new gospel: study the physiologies of host and parasite, and the ecology of their inter-relations and of their several and joint responses to climatic and soil

(Just turn the page)

## PHYSIOLOGY

**Blood Pressure and Accidents**

Why some motormen and bus drivers have the hard luck of getting their cars into accidents, while others sail along without much trouble has been investigated by two psychologists of the Personnel Research Federation.

A connection between health and accidents was discovered among older drivers, the psychologists, Dr. Walter V. Bingham and C. S. Slocombe, report. Men over 50 years of age with abnormal blood pressure had on the average more than twice as many accidents as men of the same ages and experience whose blood pressure was normal.

"It has not been generally recognized," they state, "that excessive blood pressure, even when it is not so high as to indicate danger of a sudden collapse, may nevertheless be a symptom of incipient nephritis or of some systemic condition which affects general health and temperament to an extent which they seriously interfere with safe driving."

The investigation showed that the longer a man has been operating a car or bus the fewer accidents he has. This is partly attributed to increasing skill and experience and partly to the fact that inefficient drivers tend to shift to other work. Men who learn to operate their cars economically by coasting as much as possible were also found to be more successful in avoiding trouble.

Science News-Letter, January 28, 1928

## ASTRONOMY

**Great Spot Crosses Sun Disc**

One of the largest group of spots observed in recent months is now crossing the face of the sun, according to Prof. George H. Peters, of the U. S. Naval Observatory, Washington. Prof. Peters takes photographs of the sun every clear day, and he first noticed the spot, as it came around the eastern edge of the sun, on January 17. On Friday, January 20, he photographed it again, and estimated its size as approximately 125,000 miles, or about half of the distance from the earth to the moon.

Prof. Peters pointed out that several years ago he predicted that the maximum of the approximately eleven-year period, during which the numbers of sunspots wax and wane, would be reached late this year and that it now looks as if this prediction would be fulfilled.

Science News-Letter, January 28, 1928

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### Pater Pathologroum

(Continued from page 51)

conditions; and then on the knowledge thus gained base your efforts to prevent or cure. And, true to the new trend in the companion sciences of animal and human pathology, prevention is now being stressed rather than belated curative efforts against entrenched foes.

L. R. Jones was born at Brandon, Wisconsin, in 1864. He received his bachelor's degree at Michigan in 1889, and his doctorate at the same institution in 1904. His earlier teaching and search was carried on in Vermont; in 1909 he was called back to his native state as professor of plant pathology at the University of Wisconsin.

Science News-Letter, January 28, 1928

The only export of the Dalmatian coast is pyrethrum flowers, used in making insect powder.

The asphalt lake of Trinidad has been bored to a depth of 175 feet, without striking the bottom.

Proposed legislation would require paint manufacturers to print the formula of paint on containers.

### 3200 Pictures a Second

(Continued from page 51)

Mr. Jenkins calls attention to the good photographic quality in the pictures, which is unusual in such high-speed studies. "The pictures are true photographic pictures having half-tone values like other motion pictures, not mere shadowy outlines of grayish silhouettes," he says. "They are made out-of-doors as well as in the laboratory, of large subjects or small subjects, and from a moving vehicle as readily as from a fixed platform.

"The chronoteine camera is an instrument for the study of many problems in science and engineering, some of which are not possible of accurate determination in any other way. Some additional applications of this instrument which immediately suggest themselves are a study of gun recoil, shell trajectories and plate impacts, airplane propellers and landing-gear action, bursting of balloons and air hose, tire action over obstructions, water streams, propagation of flame, engine-valve rebound at high speed; in fact, anything that moves too fast for the eye to follow can be shown slowed down and can be examined in detail at leisure and repeatedly."

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### Sealed Aztec Temple Reopened

(Continued from page 50)

depths in the temple which have not yet been uncovered.

Many small idols and ornaments of baked clay and stone have been found within the ruins, in addition to many examples of finely painted pottery, clay whistles, clay nails, and other objects beautifully decorated in the rich colors the Aztecs loved.

But the real treasures are the two sacrificial altars with their precious codices.

The most striking figure on the west altar front is the warlike Texcatlipoca, of serious mien and gorgeous trappings. He was the Divine Providence of the Aztecs, the soul of the world, the creator of heaven and earth, the lord of all things.

His figure in the frescoes stands taut, having just let fly an "atlatl," or spear, from his right hand. His body, arms and legs are black, and his face is yellow with a black stripe. He wears a blue ornament in his nose and a blue and yellow trident feather headdress in his hair.

On his breast he wears a blue ornament with dangling cascabels of gold, ancient Aztec symbols of relationship with the Evening Star. On his temple he wears the "smoking mirror," the emblem of war as well as the meaning of his name, "Texcatlipoca." He has another "smoking mirror" in place of his right foot, and from each of these curious objects issue yellow fire and blue water. In his right hand he carries a purse of precious copal gum, ready to burn for the sacrifice, and in his left he carries a shield.

On one side of Texcatlipoca stands Tonatiuh, the Aztec Sun-God, looking toward heaven. He too carries a bag of copal and in addition a sharpened femur bone and spines of the maguey plant, characteristic instruments of self-torture.

On the other side stands the warlike figure of gruesome Mictlan-tecuhtli, God of Death, his body a skeleton and his head a cranium. He has thrown about him a mantle of blue and he too has hurled a spear.

The other sides of the altar have wide horizontal bands with symbolic representations of the human heart, cranium, and hand, repeated symmetrically in red on a background of black.

The east altar has a series of pictures which were more difficult to decipher, but they contained the real key to the true significance of the temple.



PANFILO SANCHEZ, lineal descendant of Xicotencatl, chief of Tizatlan four centuries ago. He discovered the temple, and claimed to have been guided to it by dreams of buried treasure

The short front face of this altar is covered with brilliantly colored drawings of various divinities grouped around a central female figure of a yellow goddess swimming in blue water. Comparison with similar paintings on various other Aztec codices showed that this was the Goddess of Impure Love.

At her right stands a yellow tiger with black spots. His eyes are large disks, divided by a horizontal line, with the upper half white and the lower half red. On the other side of the goddess stands an eagle with his wings outspread.

The long sides of the altar are decorated with a checkerboard effect of double rows of thirteen squares containing various symbols. There are many curious conventionalized figures of scorpions, instruments of torture, and blood-signs, as well as the same conventionalized human

hearts, heads and craniums that are found on the first altar.

Archæologists find that the scorpion has various meanings among the old Aztecs. It was the sacred animal of the God of Fire as well as of the God of Death. In some codices the scorpion is the symbol for boiling water, probably because its sensation is the same as the sting of the animal, from which connection it may also symbolize fire.

In the Tizatlan codices, however, the scorpion represents self-sacrifice, mortification and penitence, Senor Noguera concludes. These figures of scorpions speak eloquently of intense fanaticism, of self-inflicted wounds in return for victory in battle, in expiation of sins, or for future blessings sought.

"These altar paintings are the evidence of exalted religious ideals of the race," Senor Noguera said. "The art is primitive and far removed from our own type of mentality, but nevertheless admirable for its execution and finish."

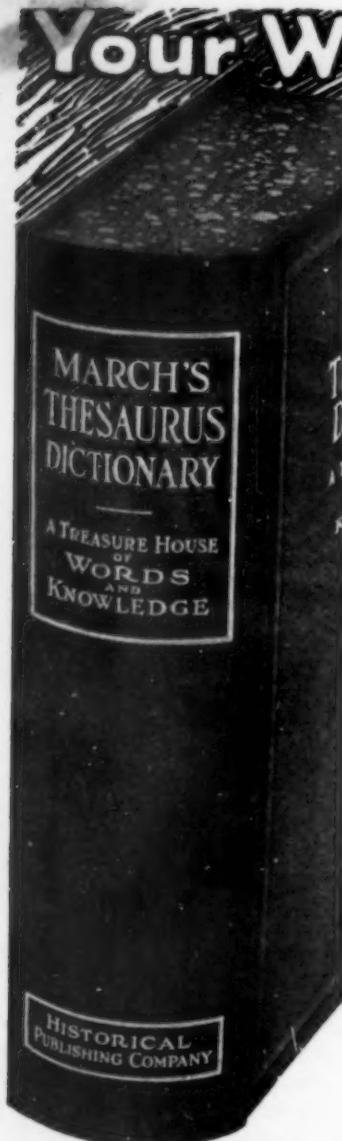
No greater religious spirit moved the medieval European artists who painted Christian saints and madonnas on chapel walls than inspired the passionate painter who left other ideals of crucifixion on heathen altar sides in the American wilderness.

Every motive in the paintings typifies some phase of Aztec sacrificial rites, and the whole series of pictures is a complete allegory showing the intensity of religious fervor and revealing the painful means by which it found expression.

Midnight was the hour for the weird rites symbolized in the paintings on the holy altar sides. The eyes of the scorpions and the other animals are shown as disks divided by a horizontal line, with the top half of one color and the bottom of another. This divided eye is the Aztec symbol of midnight.

At this hour sounded the caracols or sea-shell trumpets of the temples and awakened the priests, who formed a strange procession to the top of the temple. There they performed their bloody sacrifices. According to the colonial historian Sahagun, the Aztec word for midnight is "tatlapitzalizpan netetequizpan," or "when the caracols sound and the flesh is wounded."

There is no indication of a date or of any detail which will give an idea of the time of the pictures. They are the symbols of some great seasonal fiesta or of a dedication to some deity in whose honor the altars were built.



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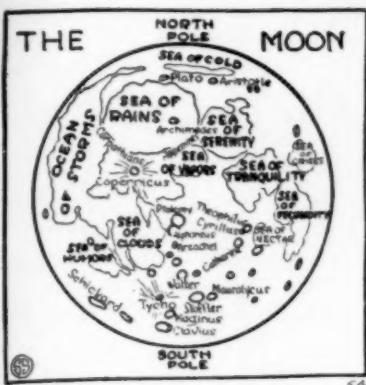
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ASTRONOMY

# Moon With Opera Glasses



By JAMES STOKLEY

With the wonderful achievements of the great telescopes in modern observatories, many people have the idea that not much can be seen in the heavens without the aid of these big instruments. But it must be remembered that the discovery of the craters of the moon, spots on the sun, the moons of Jupiter and many of the stars too faint to be seen with the unaided eye was made by Galileo and other early astronomers. Their telescopes were inferior to a good pair of modern prism binoculars, and showed scarcely more than a good pair of opera glasses.

On the moon, especially, a pair of binoculars, magnifying perhaps seven times, reveals a wealth of detail. The waterless "seas," so named by Galileo, are seen far more clearly than with the naked eye. The larger of the lunar craters, which may or may not have a volcanic origin, and which are never within the reach of the unaided eye, can easily be picked up. These are a hundred miles or so in diameter, far larger than any of our terrestrial volcanoes.

The best time for looking at the moon is around first quarter, when it is directly south at sunset. Then, as the sunlight shines at a low angle across the craters in the center of the moon's disc, shadows are formed which bring them into strong relief. As the moon waxes to full, the sunlight shines on them from the same direction as that from which we see them, and so then they are invisible. But at full moon, the seas show up best, and also the great "rays" extending from the craters Copernicus and Tycho.

The names of some of the larger lunar objects are given on the map above. These names were introduced by Giovanni Battista Riccioli, an Italian astronomer. In 1651, forty-one years after Galileo had made the first

telescopic observations, Riccioli published "The New Almagest," a ponderous Latin tome. In this appeared his map of the moon with these names that are still used. The various craters are named after great astronomers of his time and earlier, and he was careful to provide a crater for himself. Modestly, however, he chose a fairly small one. As bigger telescopes have revealed still smaller craters, more modern students of the stars have been similarly commemorated.

Science News Letter January 28, 1928

MEDICINE

## Influenza Death Rate Cut

The general death rate of the industrial population of the United States and Canada for 1927 will probably be the lowest ever reported, according to figures already available from the records of the Metropolitan Life Insurance Company. The chief factor in bringing about this decrease is the drop in the influenza death rate to about half that of 1926, with an accompanying decline in pneumonia mortality.

Deaths from tuberculosis probably will be found to have reached a new low level in 1927, it is stated, attaining a point that would have been regarded as nothing less than visionary as short a time as ten years ago. Whereas the rate was 224.6 deaths for every 100,000 of the company's policyholders in 1911, the indications are that for 1927 it will not exceed 90 per 100,000.

The year just past, however, will show no decrease in the number of accidental deaths over the last three or four years. The rising toll of the automobile, the statisticians report, along with considerably more suicides and a small increase in homicides all combine to make the 1927 record of violent death decidedly depressing.

Science News-Letter, January 28, 1928

ZOOLOGY

## **Canada to Count Musk Oxen**

The animals on the Canadian musk-ox sanctuary, one of the loneliest lands of the earth, are to be visited during the coming year by an explorer of the Canadian Department of the Interior, W. H. B. Hoare. He left Ottawa this month, taking with him a team of six Eskimo dogs imported specially from Baffin island. Proceeding as fast as possible by rail, he will then strike into the interior for the 15,000 square mile reserve in the Northwest Territories, east of Great Slave Lake. This area is almost never visited by white men, and it is believed that even Eskimos and Indians rarely go there.

Science News-Letter January 23, 1931

BIOLOGY

## **NATURE RAMBLINGS**

By FRANK THONE



Scrub Pines

When this country was being settled, there was cast ahead of the first wave of really permanent settlers a restless, poverty-bitten, migrant class of people called "movers." They never held a farm for as much as a decade, but as soon as they heard another family had moved into the next township they decided the country was "gittin' too crowded," and so sold out to the first bidder.

Of such a generation of semi-Ishmaelites are the numerous species of scrub pine to be found in all parts of the world. They are always among the first trees to arrive on a newly exposed terrain, laid bare by a fire, or the moving of a sand dune, or the rising of land from below an old tide level, or left as a mountain-side scar by an avalanche. They are "pore an' no-account" but they are tough and very patient, and they can eke out a living from a spoonful of dust in the cracks of a rock, or from the miserly nutriment offered by a heap of raw, drifting sand.

But neighbors they cannot abide. And when the more prosperous tree species begin to arrive—their settlement more often than not made possible by the soil-forming processes carried on under the shelter of the despised scrubs—the bent and knotted first-comers yield their birthright, and leave their land to the children of strangers. Their own offspring may be found again at the raw frontier, pushing out into the most hopeless places, and taming them a little, to make possible a still farther advance of the trees that will surely come again to usurp their place.

Science News-Letter, January 28, 1928

Parchment paper cut into narrow strips and plaited is being used to make very light hats.

The pod of the Brazil nut weighs from one to two pounds and contains from 12 to 22 nuts.

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## AVIATION

**World Flight Not Yet Made**

A real round the world flight is yet to be made. This is the opinion of Denis F. Cashman, of Wright Field, Dayton, Ohio. He makes this statement with full knowledge of the achievements of the flight around the Northern Hemisphere by Army planes several years ago.

His reason for making this statement is that this flight was not made along what is called a "great circle." In an article in the aeronautical journal *Slipstream* he quotes the famous explorer, Vilhjalmur Stefansson, in support of his views as follows:

"Many records will be made by what really amounts to dodging the issue. For it is essentially incorrect to speak of these successive record-breaking journeys as being around the world. They are, rather, made in a circle on the world. For a strictly round the world journey, you would have to follow what is called a great circle, so that if the earth were sawed in two right along the line of your travel, it would be divided into halves, as, for instance, if the equator were your road the whole way, or if you flew straight south over the south pole, and came back by way of the north pole. An absolute round the world trip, then, has to be a great circle, or else by a longer route, for no one could object to that."

Mr. Cashman further points out that unless this criterion is set, Commander Byrd and his pilot, Floyd Bennett, unquestionably hold the record, for in their north pole flight they "went around the world" in a few minutes as they circled the pole.

Two routes are outlined by Mr. Cashman that are truly round the world. One starts from Ecuador, near Quito, then to Natal, Brazil; across the South Atlantic to Free-town, in western Africa; across Africa with a stop at Malakal to British Somaliland; thence to Bombay; Calcutta; Rangoon; Darwin, Australia; Sydney; Auckland, New Zealand; Tahiti; Easter Island, and back to Quito. This he says would make a total distance of about 26,045 miles, the greatest distance from the equator would be 35 degrees south latitude and the longest single jump, that from Tahiti to Easter Island, about 3,150 miles, would be less than the present world's distance record.

If a flyer did not care for the hot weather that might accompany a flight so near the equator, he might choose to run over an alternative route suggested by Mr. Cashman. This is by

way of the two poles, and follows the 75th west and 105th east meridians of longitude. One jump on this route exceeds the present distance record. It is the one across the South Pole, from Cape Horn to Wilkes Land. This route is along the east coast of North America, the west coast of South America, skirting the west coast of Australia and diagonally across Asia and Europe to North Cape, Norway, from which the north pole jump is made to Wolstenholme, Greenland.

Science News-Letter, January 28, 1928

## BACTERIOLOGY

**Electric Charges of Germs**

The ability of a living diphtheria bacterium to pour poisons into the blood stream of humans bears a relation to the size of the charge of electricity which each bacterial cell carries, according to Drs. I. S. Falk, L. B. Jensen and J. H. Mills of the University of Chicago.

Their electrical measurements can be made in a few minutes and with simple apparatus on cultures thought to be capable of producing toxin. The results are obtained much more rapidly than by time-consuming methods of animal experimentation.

The electrical method is based on the fact that the power of the bacterium to excrete poisons depends on the porosity of its outer wall. This, in turn, affects the electrical charge on the cell as a whole.

The observation is made by placing the suspected organisms in a small chamber between metallic plates charged to a definite electrical potential. The rate at which the bacteria cross the electrical field is then watched through a microscope. The virulence of the germs can be calculated by reference to the rate of "migration" of a strain of diphtheria of known toxin-producing power.

This new method is expected to speed up detection of cases of diphtheria, and to facilitate release from quarantine.

Science News-Letter, January 28, 1928

## BIOLOGY

**Rabbits and Calves Grow Fast**

Mothers who are appalled at the bean-stalk speed with which children seem to grow out of their clothes can be thankful that little boys do not sprout up as fast as rabbits, cows, and guinea pigs.

Charts comparing the growth of children with that of farmyard animals have been worked out by Dr. Samuel Brody, of the Missouri Agricultural Experiment Station. Reporting his results in Science, Dr. Brody shows that a child between four and fourteen years of age grows at the rate of only ten per cent. a year, whereas young farm animals grow at the rate of 1,000 per cent. in a year. Reduced to days, this means that in less than four days the young animal gains as much as the child gains in a year.

The juvenile period in man spreads over an enormously long period of time compared with that in domestic animals, Dr. Brody states.

Science News-Letter, January 28, 1928

Clothes of children three years old should be designed so that they can dress themselves, government home economics experts declare.

—E. J. Sawyer, in *Yellowstone Nature Notes*.

Science News-Letter, January 28, 1928

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### Do You Know That—

Florida has two national forests.

The London Zoo has a hospital for ailing reptiles.

New York is taking steps to regulate and supervise aviation.

Two Italian universities are planning to establish courses in film technique and film chemistry.

A method of spraying metal on wood in order to prevent the ravages of boring insects has been invented.

A new virus to protect chickens against chickenpox has been reported by a veterinarian at the University of California.

The Church of the Holy Sepulchre at Jerusalem was seriously damaged by earthquake last July, and the dome is now being repaired.

Among the royal jewels from Russia is a figure of a goddess over seven inches tall carved from the largest known emerald in existence.

# Classics of Science:

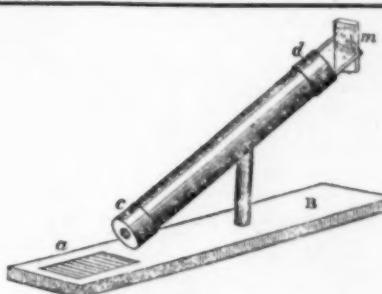
## Nicol Prisms

The inventor of the instrument for analyzing polarized light here describes his invention. Although transparent green tourmaline and Iceland spar are now very rare minerals, the other form of Nicol's apparatus, using reflecting mirrors as the source and analyzer of the polarized ray, may be made and used in the laboratory.

*MANUAL OF MINERALOGY: Or the Natural History of the Mineral Kingdom*, by James Nicol, F.R.S.E., F.G.S. Edinburgh: MDCCCXLIX (1849).

### Polarization of Light

Intimately connected with this property [optical axes of crystals] is that of the polarization of light, which, being more easily and precisely observable than double refraction, is of higher value as a mineralogical character. By this term is meant a peculiar modification which a ray of light undergoes, in consequence of which its capability of being transmitted or reflected towards particular sides is either wholly or partially destroyed. Thus, if from a transparent prism of tourmaline (the green varieties are the best) two thin plates are cut parallel to its axis, they will transmit light, as well as the prism itself, when they are placed above each other, with the chief axis of both in the same direction. But when the one slip of tourmaline is turned at right angles to the other, either no light at all or very little is transmitted, and the plates consequently appear black. Hence in passing through the first slip the rays of light have acquired a peculiar property, which renders them incapable of being transmitted through the second, except in a parallel position, and are hence said to be polarized. The same property is acquired by a ray of light when reflected, at an angle of  $35\frac{1}{2}$  degrees (or angle of incidence  $54\frac{1}{2}$  degrees), from a plate of glass, one side of which is blackened, or from some other non-metallic body. When such a ray falls on a second similar mirror at an equal angle, but so that the plane of reflection in the second is at right angles to that in the first, it is no longer reflected, but wholly absorbed. When, on the other hand, the planes of reflection are parallel, the ray is wholly and at any intermediate angle partially reflected. A ray of light polarized by reflection is also rendered incapable of transmission through a tourmaline slip in one position, which, however, is at right angles to that in which a ray polarized



*NICOL'S INSTRUMENT, using mirrors to produce a ray of polarized light. The illustration is from Nicol's book, and the construction of the instrument is described in the accompanying quotation*

by passing through another slip is not transmitted. A prism, half an inch thick, of clove-brown rock crystal, acts in the same manner as the tourmaline, but its crystallographic chief axis must be held at a right angle to the former.

### The Polarscope

In order to observe the polarization of light, a very simple instrument will be found useful. At one end of a horizontal board B a black mirror a is fixed. In the middle is a pillar to which a tube cd is fastened, with its axis directed to the mirror at an angle of  $35\frac{1}{2}$  degrees. On the lower end is a cover c, with a small hole in the center, and at the upper end another cover with a small black mirror attached to it by two arms as in the figure, and also at an angle of  $35\frac{1}{2}$  degrees. With this instrument the mirror d can be so placed in relation to a, that the planes of reflection shall have any desirable inclination to exhibit the simple polarization of light. Its use in determining the polarizing properties of minerals depends on the following principles.

### The Extraordinary Ray

As just stated, polarization may be produced either by reflection or transmission. Thus, when light falls on a glass plate, at the proper angle, part of it is reflected, part transmitted, but both portions polarized, the former in a plane parallel to the plane of incidence, the latter in a direction normal to this plane, or the two rays of light are polarized at right angles to each other. Though tourmaline, as an hexagonal or rhombohedric mineral, possesses double refraction, yet when cut as above mentioned, of a proper thickness, it only transmits the extraordinary ray E, polarized parallel to the basis OR. A slip of this mineral

may therefore be used in place of the mirror m, and another also in place of a, as in the experiment lately mentioned. Whenever double refraction takes place, the two rays, O and E, are polarized at right angles to each other; O in a plane parallel, E in one normal, to the optic chief section of the surface of incidence. A simple proof of this is obtained by fixing a rhomb of calc-spar over the hole in c now placed on the upper end of the tube, and allowing the light to pass through it and be reflected at a. Two images of the opening c will be seen, and on turning c it will be observed that the maximum intensity of the image from O corresponds with the minimum from E, and the reverse. When, however, a ray of light passes through a crystal in the direction of an optic axis, the polarization of the light disappears along with the double refraction, the ray acting like common light.

**James Nicol** was born August 12, 1810, in Peeblesshire, Scotland, and died April 8, 1879, at Aberdeen. He went to the University of Edinburgh in 1825, studied geology under Jameson, and continued his studies at the Universities of Bonn and Berlin. In 1844 he published "Guide to the Geology of Scotland." He became professor of Geology in Queen's College, Cork, in 1849, and professor of natural history in the University of Aberdeen in 1853. The "Manual" from which our description of his instrument is taken, was published when he was 39 years old.

Science News-Letter, January 28, 1928

### ARCHÆOLOGY

#### Hundred Maya Skeletons

A hundred skeletons and 2,500 records of the size and other physical characteristics of living modern Maya Indians of Yucatan brought back to the Peabody Museum at Harvard by Dr. and Mrs. G. D. Williams may give an insight into the kind of people who erected great cities and developed a culture in America long before the coming of Columbus.

During an anthropometric survey of the Mexican state of Yucatan, Dr. Williams obtained information on 2,000 adults and 500 children of the descendants of the ancient Maya and also secured for scientific study the skeletons of a hundred present day Mayas. Metabolic tests were included in the studies. The expedition that was in the field for eight months was under the auspices of the Bureau of International Research of Harvard University and Radcliffe College.

Science News-Letter, January 28, 1928

Distances of the nearer stars are found by a triangulation process similar to that used by surveyors.

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## ZOOLOGY

**Yellowstone Bighorns Fight**

The younger generation among the bighorn mountain sheep rise up against their elders, as do youth of better-known species. But they do have the virtue of being straightforward about it, and of fighting fair. So says M. P. Doyling, a government engineer, who describes an interesting battle he saw a short time ago in Yellowstone National Park.

"Although they were not more than fifty feet from the edge of the road, they didn't pay the slightest attention to the car I was in, and I sat for about fifteen minutes and witnessed a most unusual and interesting sight," he reports.

"There were two young rams fighting an old and somewhat heavier one. What surprised me most was their method of attack, in which they were 'true gentlemen.' They would stand about twenty feet apart and both start at precisely the same time, coming together, always directly head-on. Only after one has seen the size of the horns on the little animals and knows the speed at which they travel can one imagine the terrible shock it must be to them at each such encounter.

"I expected to see them butt each other in the sides and rear, but in every instance they waited for the other to get set and then always come head-on. After each such encounter they would stroll around for a minute or two, sometimes even taking a few mouthfuls of grass, before going through exactly the same performance again. If one tried to lie down, as did happen several times, the other would be over immediately and bother him until he got up.

"In one encounter one of the rams was on higher ground than the other, but, apparently, to counteract this condition, the one on the low side reared up on his hind legs and came down just in time to hit the other square in the center between the horns. After a bit, one of the young rams strayed away a couple hundred feet and, after pawing away the dirt on the side hill, became, for the time being, an interested spectator. The other young one kept at the old ram, however, and every minute or two they would have another encounter.

"I doubt very much if the old ram could stand this relay of encounters for a great period, as he was panting heavily and blood was coming from his nose when I left the scene of action."

Science News-Letter, January 28, 1928

## PHYSIOLOGY

**Cause of Lost Appetite**

Parents with offspring that have to be forced to eat will be glad to know that scientists are on the trail of the reasons back of lack of appetite.

Prof. J. C. Drummond, well-known vitamin specialist, and Dr. S. K. Kon of University College, London, have found that there is a close relationship between the amount of vitamin B in the diet and the total amount of food taken. Pigeons fed a diet adequate in all respects except that it lacked vitamin B lost all appetite for the meals presented to them. Another group of pigeons kept under observation as controls, fed as much food as they wanted along with an ample ration of vitamin B, grew healthily and retained normal appetite. A third group, fed only the amount of food that the first group actually ate plus a plentiful supply of the vitamin in question, showed loss of weight due to slight starvation.

From their results, Professor Drummond and Dr. Kon concluded that the loss of weight that is always associated with lack of Vitamin B is simply caused by partial starvation; the pigeons lose their appetites and refuse to eat the deficient food, and hence lose weight.

Since vitamin B occurs in only minute quantities in different foods, its presence becomes of increasing importance. Consequently, an elaborate study of this question has been taken in hand at the Chemical Department of St. Thomas' Hospital Medical School, London, by Dr. R. H. A. Plimmer and his colleagues. They tested a number of cereals by feeding them to pigeons for a long period. They found that none of the cereals examined contained such a rich amount of vitamin B as dried yeast. Wheat, barley and rye contained more vitamin B than maize or oats. These investigators, like Professor Drummond and Dr. Kon, found that young animals need more vitamin B than adults, and that the first important symptom is loss of appetite, which leads to loss of weight.

Science News-Letter, January 28, 1928

Investigations indicate that at least one-fourth of the children in the United States are malnourished.

The whale can take enough oxygen under water to stay an hour or more, and then can come to the surface rapidly without the discomfort that attends the coming up process for deep-sea divers.

## MALACOLOGY

**Are Your Pearls Genuine?**

By LEWIS RADCLIFFE

Mr. Radcliffe is U. S. Deputy Commissioner of Fisheries.

You may have longed for a simple test to determine the freshness of your breakfast egg without having to delve into its innermost secrets. Your longings have been slight as compared with the longings of those who have invested large sums in pearls and who wish to know definitely whether they were natural (sometimes called genuine) pearls or culture pearls or possibly only imitation pearls. You will want to do a bit of investigating before investing, as there is a very wide difference in the value of those classes.

True pearls derive their origin from the accidental introduction of an irritating foreign substance into certain cell tissues of the pearl oyster or other pearl-bearing mollusc. This foreign substance—parasitic worm, watermite, grain of sand—which finds its way by accident into the tissues of the oyster becomes the nucleus of a natural pearl, the most prized and most valuable of the three classes. The cells of the oyster proceed at once to imprison the foreign substance, surrounding it with layer upon layer of nacreous material, of the same iridescent character as the inside shell of the oyster.

Since the discovery of the origin and the growth of natural pearls, man has been striving to produce these results by artificial means, that is, to grow culture pearls. Simple as the process may seem, it was not until 1894 that Kokeihi Mikimoto in Japan developed a satisfactory method for inducing the development of culture pearls. The success of this venture is attested to by the fact that he was able to produce an annual output valued at \$600,000 in 1921.

Imitation pearls are a synthetic product manufactured in large quantities from pearl essence—a product derived from fish-scales. Formerly the source of supply was a small European minnow, the iridescent effect being discovered by accident by Jaquin, a French rosary maker, about 1656. Jaquin noted that the water in which the fish had been washed contained a highly lustrous substance which, when concentrated and applied to small globes of alabaster, produced remarkably good imitations of pearls. During the World War, the European source of supply of fish scale essence or pearl essence was cut off. Experiments with the scales of native American fishes resulted in the development of an entirely new industry in this

(Just turn the page)

**Are Your Pearls Genuine?**

(Continued from page 61)

country. Some two million pounds of the scales of such fishes as our north Atlantic sea herring and river herring are used annually, the uses for fish scale essence are steadily increasing and the cost of producing excellent imitation pearls is decreasing. Large sheets of celluloid are also given a coating of imitation mother-of-pearl and used as backs for brushes and many other toilet articles.

But to return to the question of the freshness of the egg or rather to means for distinguishing between the three classes of pearls under discussion, as pearl essence is usually applied as a thin coating little difficulty will be experienced in ascertaining whether your possession is an imitation pearl. The celluloid coating can be cut or peeled off or dissolved off with amyl acetate or acetone.

As between culture pearls and natural pearls the problem of differentiation is a most difficult one. Yet, because of the difference in sales value, one buying a natural pearl wishes to assure himself that he is getting what he is paying for. In perfection of form and lustrous beauty there are no distinguishable differences. There is no chemical difference, the same cells of the oyster function after the same manner in producing a pearl. When the culture pearls began appearing there was considerable litigation in France and the courts concluded that culture pearls possessed all the specific characteristics of real pearls and their quality could not be questioned.

Since 1923, a small group of Japanese investigators acting on the suggestion of Professor Nakamura have been studying the problem, and have recently published the results of these investigations in the Proceedings of the Imperial Academy of Tokyo, Japan.

By the use of the X-rays they were able to distinguish between culture pearls and natural pearls. In the former, a perfectly spherical nucleus of shell is introduced into the oyster and around this the oyster builds the pearl. An examination of natural pearls, of culture pearls, and of the nuclei used in culture pearls by the expert in X-ray analysis and a comparison of the patterns produced for different orientations of the primary X-rays revealed valid differences between the two classes of pearls. It will undoubtedly be comforting to many to know that a method of differentiation has been evolved.

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Science News-Letter, January 28, 1928

**DELUSION AND DREAM**—Dr. Sigmund Freud. Translated by Helen M. Downey—*New Republic* (\$1). The interesting experiment of analyzing dreams recounted in a fiction story was made with considerable detail by Dr. Sigmund Freud, using Wilhelm Jensen's novel, "Gradiva." The first half of this edition contains the story, an entertaining little novel of a young archaeologist who fell in love with a girl on an antique bas-relief, and later found her at the ruins of Pompeii. The second half contains Freud's psychoanalysis of the dreams and of the story itself.

Science News-Letter, January 28, 1928

**ELEMENTARY CONDITIONS OF HUMAN VARIABILITY**—Raymond Dodge—*Columbia University Press* (\$1.50). A series of investigations on the knee jerk, eye reactions, and other responses to stimuli at different levels of the cerebro-spinal system in human beings. A valuable contribution to libraries of experimental psychology.

Science News-Letter, January 28, 1928

**HISTORICAL FOUNDATIONS OF MODERN EDUCATION**—Edward H. Reisner—*Macmillan*. Education, from Homeric days to the seventeenth century, is discussed in the light of changing types of civilization. Dr. Reisner carries his text up to the time when the classical heritage of education began to be pushed from the center of the academic stage to make way for the scientific method and modern literatures.

Science News-Letter, January 28, 1928

**THE NEW DEMOCRACY**—Walter E. Weyl—*Macmillan* (\$2.25). A revised edition of Dr. Weyl's book describing the conflict between the plutocracy of today with the democracy of tomorrow.

Science News-Letter, January 28, 1928

**MANUAL FOR SMALL MUSEUMS**—Laurence Vail Coleman—*Putnam*. "There are a thousand museums in the United States and nine of them in every ten are small," writes Mr. Coleman. Pioneer experimenting in making the small museum most useful is beset with difficulties, and a comprehensive manual of this sort should be a welcome guide to those who are working in this field. Mr. Coleman goes into detail on such subjects as, catalogues, installation of exhibit cases, publicity campaigns, the important subject of finance.

Science News-Letter, January 28, 1928

**WHERE AND HOW TO SELL MANUSCRIPTS**—William B. McCourtie—*Home Correspondence School* (\$3.50). A new and very complete guide to the literary markets of the United States, Great Britain and other English-speaking countries.

Science News-Letter, January 28, 1928

**MAKING CITIZENS OF THE MENTALLY LIMITED**—Helen Davis Whipple—*Public School Publishing Co.* A much needed guide book for teachers who are exploring in the comparatively new field of helping subnormal children, describing lesson material and procedure in developing character and in teaching these children to use their hands and minds.

Science News-Letter, January 28, 1928

**HEALTH BEHAVIOR**—Thomas D. Wood and Marion Olive Lerrigo—*Public School Publishing Co.*—A manual that gives approximate standards of healthful behavior for various age groups of children and high school students intended for use by teachers and workers supervising programs of health education.

Science News-Letter, January 28, 1928

**HOW TO MAKE THE PERIODIC HEALTH EXAMINATION**—Eugene Lyman Fisk and J. Ramser Crawford—*Macmillan* (\$4). The growing custom of having a periodic physical examination makes this practical manual designed to serve as a guide to the general physician particularly opportune.

Science News-Letter, January 28, 1928

**TRIUMPHS OF MEDICINE**—Henry S. Hartzog—*Doubleday, Page*. Great achievements and personalities in the evolution of medicine described by a layman for the general reader. No pretensions to elaborate style but carries a foreword of approval by a professor of a well known medical school.

Science News-Letter, January 28, 1928

**THE CHANGING COLLEGE**—Ernest Hatch Wilkins—*Chicago University Press* (\$1.50). Significant changes that are in progress in educational institutions at the present time are discussed by a former dean at the University of Chicago.

Science News-Letter, January 28, 1928

**EDUCATION IN A DEMOCRATIC WORLD**—Ernest DeWitt Burton—*Chicago University Press* (\$2). Student habits, the obligations of the educated and ideals of a university are some of the themes of these lectures given mostly while Dr. Burton was president of the University of Chicago.

Science News-Letter, January 28, 1928

**HARVARD TESTS: ELEMENTARY PHYSICS, FORM B**—N. Henry Black and Frances M. Burlingame—*Ginn* (60c). A second set of true-false tests for gauging knowledge of elementary physics, judging aptitude for advanced work, and analyzing weak points in a student's knowledge of the subject.

Science News-Letter, January 28, 1928

### EVOLUTION

#### Lyell, Anti-Simian

Quotation from CHARLES DARWIN: THE MAN AND HIS WARFARE—Henshaw Ward—Bobbs-Merrill Co.

Consider what Lyell had to lose by adopting the new theory. A vital part of his *Principles*, the most authoritative text during thirty years, would have to be recanted and destroyed. There would be a far more serious loss. For thirty years Lyell had loathed the thought of being descended from apes: to accept the *Origin* was to lose faith in his gentlemanlike superiority to beasts. Of course that may be a despicable influence in a scientist's brain, and no doubt Lyell hated to admit it; but it appears clearly in his letters. He declared it plainly to Darwin as soon as he had read the proofs in October: "It is this which has made me so long hesitate, always feeling that the case of Man and his races, and of other animals and that of plants, is one and the same . . . and that if a 'vera causa' be admitted for one . . . all the consequences must follow."

It was the deliberate judgment of Huxley, who was closely associated with Lyell in gathering data about the skulls of apes, that Lyell would have adopted Darwinism much sooner if he had not dreaded all the consequences that must follow—the simian ancestry.

Science News-Letter, January 28, 1928

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